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OBSERVATIONS ON THE HABITS OF AN INTRODUCED PINE SAWFLY DIPRION SIMILE HTG.*

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On August 22, 1933, while the members of the Montreal staff were inspecting a nursery in Montreal, P. Q., a small number of sawfly larvae was observed feeding on the mugho pine trees. These were submitted to Ottawa and were identified as the larvae of *Diprion simile* Htg. This was the second record of the appearance of this species in Canada; the first being a record from Oakville, Ont., in 1931. This insect had previously been studied in the Northeastern United States by Britton and Zappe (1917) and Middleton (1923).

The present study was undertaken in view of some uncertainty as to the reaction of the species to Canadian conditions, there being no definite information available relating to the over-wintering habits. The above mentioned authors have dealt very fully with a history of the insect in Europe prior to its introduction to North America, and state that there is still some doubt as to the exact status of *simile* as a species distinct from *Diprion pini* L., the two being associated in many forest infestations in Europe, but Enslin (1917) has separated the two species on the grounds of differences in both male and female genitalia.

The present paper is of a preliminary nature and is based on observations made during the season of 1934.

SUMMARY OF LIFE HISTORY.

Under the experimental conditions the over-wintering larvae changed to pupae during the middle of May, and the adults appeared on the wing late in May and early in June. The eggs of the first generation were incubated in ten to fourteen days. The majority of the larvae completed their development and constructed cocoons by the second or third week in July. The time spent in the summer cocoon varied from eleven to sixteen days, and adults were flying again during the last two weeks of July. The eggs of the second generation only took seven or eight days to incubate, but the larval life of this brood was considerably slowed up by the low night temperatures experienced during August, and the majority of larvae had not constructed over-wintering cocoons until the middle of September.

As Middleton (1923) has observed, some larvae do not pupate within the cocoons at the regular periods, but may emerge at irregular intervals throughout the season. In this way a number may also be carried over through one, two and sometimes three seasons. After only one season of study, the data on this point is as yet incomplete. Under field conditions this phenomenon appeared to be more pronounced, as there was considerable overlapping of stages caused by the late emergence of adults throughout the season. In general, however, it may be said that in the Montreal area two well defined generations occurred in 1934.

*Contribution from the Division of Foreign Pests Suppression, Ent. Br., Dept. of Agriculture, Ottawa.

EXTENT OF INFESTATION.

At present the insect seems to be confined to a small area in the Westmount, P. Q., residential district. There is also an isolated infestation in the Cote des Neiges Cemetery, Montreal.

HOST PLANTS.

Diprion simile will attack any of the species of *Pinus* commonly growing in the Province of Quebec. Experiments have shown that *P. montana* Lam., *P. sylvestris* L., *P. banksiana* Lamb., *P. resinosa* Ait., and *P. strobus* L., are all readily selected for oviposition, preference being shown for the five needled *Pinus strobus*.

HIBERNATION.

During a preliminary survey of the infestation in October, 1933, it was noted that the majority of the cocoons appeared to have been formed either on the branches or adhering to needles of the pine trees. Unfortunately, a heavy snowfall and severe weather on October 25 precluded any further analysis of the over-wintering habits.

The winter of 1933 to 1934 was one of the most severe on record at the McGill University Meteorological Station. Both November, 1933, and February, 1934, were recorded as the coldest on record. On December 29, the minimum temperature was –29.4 F. Owing to a slight thaw at the beginning of the month, January was a normal month. During the winter a total of 116 inches of snow fell, most of which remained without thawing.

On the resumption of this study in the spring of 1934, it was soon realized that the severe conditions noted above had killed a large proportion of the cocoons formed on the branches of the trees. The following tables shows the results of this survey:—

WINTER MORTALITY 1933-1934

No. Examined	Situation	No. Dead	Percentage Survival
540	Above 3 feet from the ground.	540	nil
37	Below 3 feet but on tree.	13	65%
8	On ground.	2	75%

Despite this heavy mortality enough individuals came through to re-establish the infestation, and there is no doubt that if control measures had not been undertaken the infestation would have been quite as heavy in the autumn of 1934 as it had been in 1933.

It is thus apparent that the problem of the over-wintering habits is of prime importance in determining the potential threat of this insect under Canadian conditions. At the time of the formation of the summer cocoons it was observed that a very small proportion of them were constructed on low-lying shrubs, or on blades of grass near to the base of the trees. Cocoons were also found constructed on species of *Juniperus* and *Berberis* and also on *Thuya occidentalis* L.

During the study of this insect a light infestation was found in a plantation of conifers in the Cote des Neiges Cemetery, Montreal. This was thought to be a suitable place for a study of the over-wintering habits. In October, a number of trees were examined from base to summit, and the ground was also carefully

searched. The results obtained are illustrated diagramatically in the text figure. A number of these cocoons were marked with paint in order to allow a determination of the number of cocoons falling during the winter months. In addi-

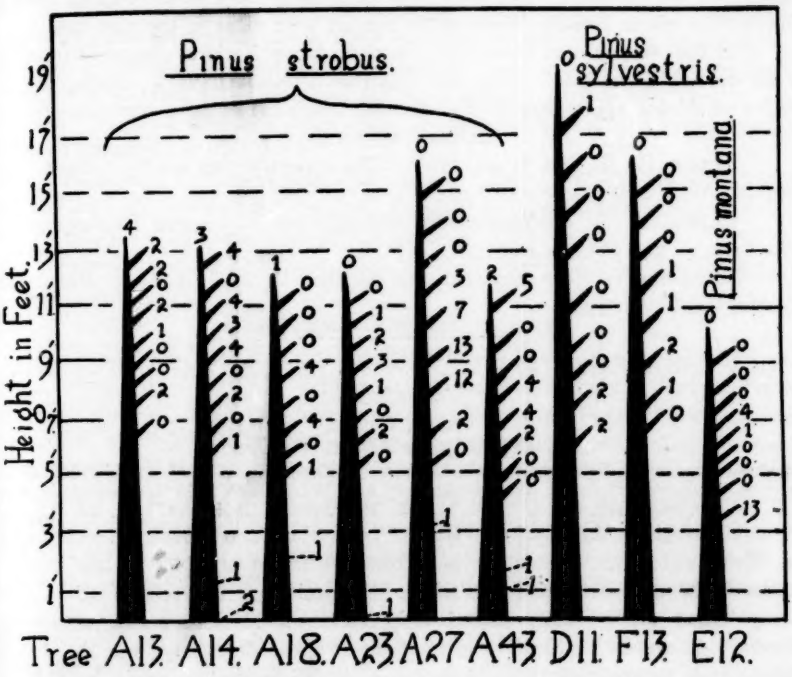

Diagram of the vertical distribution of cocoons of *Diprion simile* Htg. on pine trees in a small plantation. Tiers of branches corresponding to the various years of growth are represented by thick lateral lines. The number of cocoons on each tier is shown. The figures on the lower parts of the trees refer to cocoons found on the trunk. Two cocoons were found on the ground at the base of tree A14.

tion, the trunks and bases of a number of trees about seventeen years old were examined. The result of this survey is summarized as follows:—

SUMMARY OF TRUNK SURVEY.

Species	Total No. Trees Examined	No. Trees with Cocoons on Lower Trunk	No. Trees with Cocoons on Ground	No. Trees with Cocoons on Trunk up to 6 ft. from Ground
P. strobus	133	61	10	77
P. sylvestris	27	1	0	1
P. nigra	3	0	0	0
P. montana	12	0	0	0

The cocoons found on the branches of the trees were usually clustered at the bases of the smaller twigs. Those on the trunks were found either in crevices of the bark or in the round holes left by the branches which had fallen during self-pruning. Of those found on the ground three were lying loose without any

sign of ever having adhered to anything; one was marked as if it had been formed on a white pine needle and then fallen away, two were found adhering to blades of grass while the remainder of four was found attached to some small shrubs growing at the bottom of the trees. Several cocoons were also found on isolated *Thuya* trees whose branches were not in contact with those of the pine tree.

In this survey only those cocoons were counted which obviously belonged to the current generation. This fact could be determined with certainty by the fresh and shining appearance of the silk with which the cocoons were constructed.

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Enslin, E., Die Tenthredinoidea Mitteleuropas. Deutsche Entomologische Zeitschrift, p. 540-565, 1912-1917.

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NEW CANADIAN EUCOSMIDS WITH NOTES (LEPIDOPTERA)*

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Exartema punctanum Wlshm.

Exartema punctanum Walsingham, 1879, Ill. Lep. Het. Brit. Mus. IV, 37, Pl. LXVIII, fig. 8.
Exartema cornanum Heinrich, 1923, Proc. Ent. Soc. Wash. XXV, 112 (as *connanum, laps. cal.*) *id.* 1926, Bull. 132, U. S. N. M. 142; McDunnough, 1933, Can. Jour. Res. IX, 513.

Walsingham described the species from 1 male, 2 females, from Shasta Co., Calif. Heinrich, in his revision, confines the distribution to the eastern section of the continent and in his key to the species (p. 132) characterizes it as having "basal patch heavily shaded with black, the blackish scaling extending diagonally to middle of costa." Neither the original description nor the figure bears out this characterization; the figure, while somewhat crude, notable in the too great prominence given the outer patches as compared with the basal one, certainly shows no connecting band between the basal patch and the midcostal one; further the description distinctly calls for a dark spot at end of cell, in fact the name is based on this feature. It seems obvious that the true *punctanum* is the species described by Heinrich as *cornanum* which name unfortunately must fall into the synonymy.

I have before me a series of 10 specimens, mostly bred from *Cornus*, from Seton Lake, B. C., secured by myself in 1933 in late July and early August; these fit in quite well with Walsingham's figure, having due regard to the inaccuracies mentioned above, and establish the species as occurring in the Pacific Coast region. The maculation is slightly better defined than in our long series of Ontario specimens, but otherwise I can detect no differences. For the *punctanum* of Heinrich no name is available and I, therefore, describe this species as follows:

Exartema connectum n. sp.

Exartema punctanum Heinrich (*nec* Walsingham), 1926, Bull. U. S. N. M. 141; McDunnough, 1933, Can. Jour. Res. IX, 514.

Very similar in size, coloration and maculation of primaries to *punctanum*

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*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

Wlshm., but the dark basal patch is connected by a diffuse dark streak to the mid-costal spot, giving the appearance of a dark oblique band from inner margin at base to middle of costa; the basal portion of the costa contained within this band is whitish. Other maculation obscurely olivaceous with the subapical bar somewhat more prominent and at times extended to apex of wing by slight dark suffusion. There is no dark discal dot but an irregular extension of the tornal patch takes its place as a pale olive (at times darker) narrow bar. In the male genitalia the spined digitus is longer than in *punctanum;* it also is broadened and flattened apically.

Holotype— ♂, Bobcaygeon, Ont., July 5, 1931, (J. McDunnough) (reared on *Cornus*); No. 3890 in the Canadian National Collection, Ottawa.

Allotype— ♀, same data, July 8, 1932.

Paratypes—6 ♂, 5 ♀, same data, June 29, 1931; June 26, 27, 28, July 3, 5, 8, 10, 11, 15, 1932.

Exartema viburnanum n. sp.

Palpi light ochreous, tipped with black; head light ochreous, suffused with ruddy brown and with a slight blackish tuft medially behind antennae; thorax deep black-brown. Primaries deep shining purplish in basal half of wing, shading into a paler shade with slight ruddy tinge in outer half, the usual maculation very deep black brown, edged faintly and narrowly in outer half of wing with light red-brown. Basal patch obscure and considerably suffused by the purple ground color; median band well-defined on outer side by the paler ground-color, the subcostal teeth much as in *permundanum* Clem., both teeth being slightly longer than in this species and with a prominent excavation beneath the lower tooth, after which the band broadens out above inner margin and becomes more or less connected with the triangular tornal patch; a dark curved subapical bar, narrowly connected with a dark patch on costa; the usual four geminate oblique streaks on outer half of costa, separated by small dark patches. Fringes deep smoky, slightly paler below apex and at anal angle. Secondaries deep smoky outwardly, paling in both sexes to a dirty white in the costo-basal portion, much as in *submissanum* McD. Fringes pale with dark basal line. Genitalia of the *permundanum* type and with no very distinct characteristics. Expanse 16-17 mm.

Holotype— ♂, St. David's, Ont., June 24, (W. L. Putman) (reared on *Viburnum lentago*); No. 3891 in the Canadian National Collection, Ottawa.

Allotype— ♀, same data, June 27.

Paratypes—2 ♂, 1 ♀, same data, June 23, 27, 30.

In Heinrich's revision this species would key to *tenebricum* Heinr. which, however, has a different type of genitalia. The deep purple-brown color of the primaries, much as in certain specimens of *nigranum* Heinr. combined with the pale basal area of the hindwings, renders the species a quite striking one.

Epiblema lyallana n. sp.

Male. Palpi brown with an admixture of ochreous, especially at base; head and thorax similarly colored, with a rather grizzled appearance, the ochreous shading on thorax being most marked on the patagia. Forewings deep purplish, rather metallic; with heavy shading of deep brown and scattered pale scaling in basal area; a large subquadrate whitish patch on middle of inner margin, ex-

tending upward to middle of wing and with rather irregular lateral edges; this patch is bordered both inwardly and outwardly by bands of deep black-brown scaling; costa beyond basal area with alternate spots or streaks of dark brown and pale whitish, the former enlivened slightly with light brown scaling; a large, conspicuous, subapical, quadrate patch of deep brown; immediately below this three dark transverse streaks, separated by light brown scaling, and bordered by broad purplish metallic bands, represent the ocellar patch; the outer edges of the purplish bands show slight whitish scaling, the inner one being connected with a central purplish area, immediately basad of the dark subapical patch; tornal patch represented by dark scaling, not well-defined and partially connected with one of the dark costal spots by a narrow, oblique band of pale and dark scaling; from the lower outer corner of subapical patch a narrow dark band connects it with outer margin above anal angle; outer margin sprinkled with scattered light brown and whitish scales, beyond which is a fine dark terminal line. Fringes deep purple-brown; subapically for about one-quarter the length of outer margin, the fringes are distinctly whitish, overlaid and obscured, however, in their basal half by purplish scaling. Secondaries deep smoky brown; fringes deep grayish with a dark basal line.

Female. Similar to male, but with an extra pair of pale costal streaks beyond basal area, these in the male being obscured by the end of the dark costal fold. Expanse, ♂, 15 mm.; ♀, 16 mm.

Holotype—♂, Mt. Lyall, Gaspe Co., Que., July 25, (W. J. Brown); No. 3870 in the Canadian National Collection, Ottawa.

Allotype—♀, Gaspe Co., Que., July 27, (E. B. Watson).

Paratypes—1 ♂, 1 ♀, Mt. Lyall, Que., Aug. 2, 4, (W. J. Brown).

The species traces to *infelix* Heinr. by Heinrich's key but while obviously belonging in this group, does not agree with this species either in size, pattern or genitalia; the large quadrate subapical patch seems distinctive.

Epiblema iowana n. sp.

Male. Palpi smoky brown, light ochreous at base; head with an admixture of smoky and ochreous scales, of a general grizzled appearance, with the anterior half of front light ochreous. Thoracic vestiture denuded but patagia appearing smoky brown, tipped with ochreous. Primaries deep brown, shaded with purplish gray, especially in outer half, and with a prominent pale patch at middle of inner margin. Costal fold extending half way to apex, barred with dark and pale alternating bands; basal patch dark, crossed by an obscure band of pale scaling (specimen rather rubbed); outer margin of basal patch outwardly oblique to upper edge of cell and then almost rigidly perpendicular to inner margin, forming inner edge of dorsal white patch; this patch subquadrate, extending well into cell and rather obscurely connecting with a pale area in costal third of wing which borders basal patch outwardly and is crossed by some darker lines. Beyond costal pale area and starting at about middle of costa *an oblique, deep brown band extends to middle of wing;* outer margin of pale dorsal patch obscured by purple-gray scaling with several dark streaks along inner margin; tornal patch represented by irregular deep brown shading; ocellar patch consisting of two rather broad, upright bands of metallic purplish separated by a narrow line of dark

scaling which connects costad with an irregular subapical deep brown patch from the lower outer corner of which an oblique dark line runs to outer margin above anal angle. Outer half of costa with four pairs of pale streaks separated by small, deep brown patches which tend to send fine, paler brown streaks inwardly; the third pair of pale streaks gives rise to a curved purplish-metallic line which forms the outer border of the above mentioned subapical dark patch; a semicircular dark apical spot bordered inwardly by an extension of the last pale costal spot. Fringes deep purplish-gray, paling towards anal angle and suffused with deep brown in apical area of wing. Secondaries deep smoky brown, paling somewhat toward base; fringes dull smoky, with paler tips and a darker basal line; almost whitish at anal angle and along anal margin.

Female. More heavily marked than the male, the oblique dark band from middle of costa extending across wing and connecting with tornal patch; the subapical patch similarly connected with a dark spot on costa; dorsal pale patch slightly more obscured outwardly with grayish shading; apical dark spot less distinct. Secondaries not so distinctly paling toward base of wing. Expanse, 16 mm.

Holotype—♂, Renwick, Ia., May 19, 1928 (G. S. Walley); No. 3871 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

The sex association appears to be correct, although there are some differences in maculation as noted; the species is closely allied to *periculosana* Heinr. from the Canadian Rockies, but is decidedly stouter with rather different maculation in the apical half of primaries, notably the dark oblique band from middle of costa, this area in *periculosana* being pale; the hindwings are also much deeper in color in the present species. The male genitalia show certain distinctions from *periculosana,* such as a longer sacculus, a much stouter cucullus, and a broader and more squarely truncate uncus; in some respects they are close to the figure of *gratuitana* Heinr.

Epiblema purpurissatana Heinr.

Epiblema purpurissatana Heinr., 1923, Bull. 123, U. S. Nat. Mus., 149.
Epiblema gratuitana Heinr., 1923, *op. cit.* 268.

With the holotype of *purpurissatana* before me and also a small series of what is obviously *gratuitana,* according to genitalia, from Victoria, B. C. and from localities in Nova Scotia, I feel inclined to suggest the above synonymy. The type of *purpurissatana* was bred from rose at Vernon, B. C., and is obviously a dwarfed specimen, due probably to undernourishment; the genitalic differences mentioned by Heinrich appear to be caused by the position of the claspers in the slide of the *purpurissatana* type, where they are pressed considerably downward, especially on the right side, as can readily be seen in Heinrich's figure; the more normal position would be the one indicated in the drawing of *gratuitana* (fig 431). Both show the two rather characteristic small spines at the apex of the aedeagus.

Apart from size I can find no tangible differences either in color or maculation between the *purpurissatana* type and our series under *gratuitana.*

Epinotia similana Hbn.

Epinotia similana Heinrich, 1923, Bull. 123, U. S. N. M. 200, Pl. 52, fig. 358.

This well-known European species has been recorded from various points on the North American continent; in the Canadian National Collection it is represented by specimens from Bridgetown, N. S., Ottawa, Ont., Biscotasing, Ont., Aweme, Man., and Nicola, B. C. The deep brown color of the forewings with the large white dorsal spot and similarly colored ocellar patch render the species easily recognizable and the only species with which it is liable to be confused is *Epiblema otiosana* Clem. from which, however, it is easily differentiated on palpal characters. Apparently it is very constant in maculation as I can find no reference in the European literature to variations such as occur in its close ally, *solandriana* Linn.; the differences in male genital structure between these two species are well illustrated by Heinrich, the chief difference being found in the greater length of the cucullus of *solandriana*.

In going over our material I have sorted out some specimens which, while practically identical with *similana* in male genitalia, are markedly distinct in the maculation of primaries; owing to the fact that no variation in pattern has been recorded for *similana* I am regarding them for the present as representing an undescribed species and offer the following description:

Epinotia sperana n. sp.

Maculation very similar to that of *similana* but both the dorsal spot and the ocellar patch are strongly strigulate with grey-brown and in consequence quite obscure. The general color of the forewing is deep smoky brown, paling outwardly, with light brown and black scaling subapically and some black scaling in the dark tornal patch which separates the dorsal and ocellar patches. There is a brown vertical bar in the ocellar patch. Secondaries light smoky, paling somewhat basally. Expanse 17 mm.

Holotype— ♂, Hopedale, Labrador, Aug. 22, 1928, (W. W. Perrett); No. 3892 in the Canadian National Collection, Ottawa.

Paratype— ♂, Nordegg, Alta., Aug. 1, 1921, (J. McDunnough).

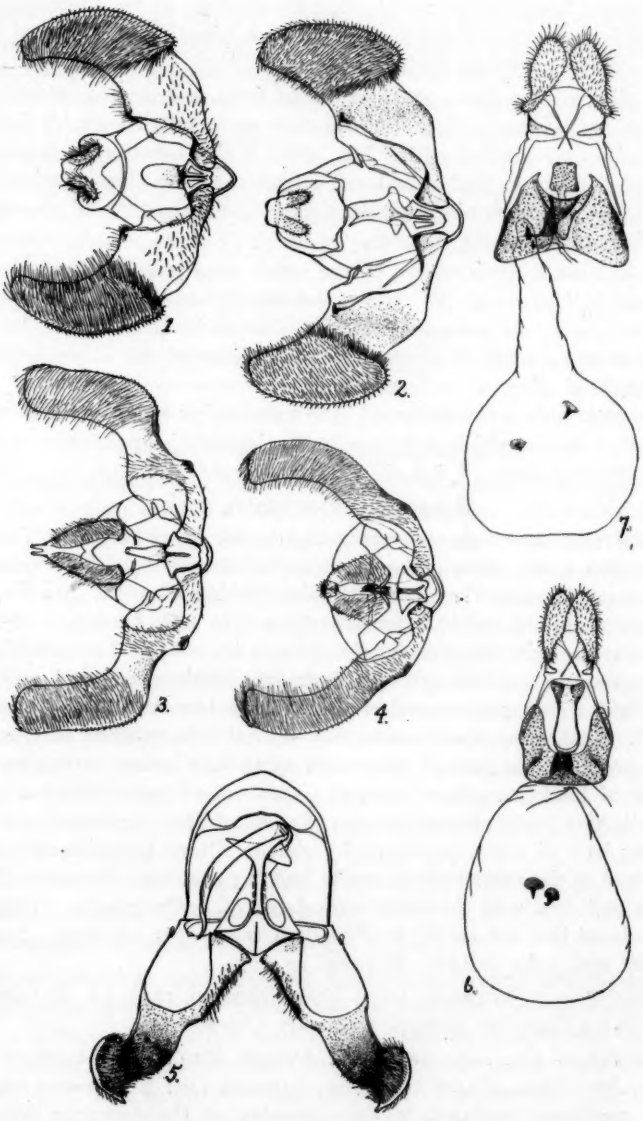
The Nordegg specimen is more suffused with light brown outwardly than the Labrador one but the same obscureness of the two pale spots is present in both.

A small series of rather worn but quite constantly marked specimens captured by myself in a clump of dwarf willows on Signal Mt., Jasper Park, Alta. (Aug. 27, 1933) at an altitude of about 5500-6000 ft. would seem also to belong here; they are rather larger in size and of a more evenly smoky brown coloration but agree in other particulars. They could easily be mistaken for a dark form of *solandriana* but (when present) the oblique, postmedian, dark shade is of more or less even width throughout and not constricted at tornos as is usually the case in *solandriana*.

As already noted the male genitalia are more or less identical with those of *similana;* the cucullus is possibly a shade longer and the lower margin of the sacculus more evenly rounded towards the neck, but the differences are very slight.

Epinotia momonana Kft.

The species was described from eight females from Ottawa, Ont., and Rounthwaite, Man., and Heinrich (1923, Bull. 123, U. S. N. M., 212) has desig-



EXPLANATION OF PLATE.

Male Genitalia of 1. *Epiblema lyallana* n. sp.; 2. *Epiblema iowana* n. sp.; 3, *Epinotia removana* n. sp.; 4. *Epinotia momonana* Kft.; 5. *Dichrorampha vancouverana* n. sp.

Female Genitalia of 6. *Laspeyresia costastrigulana* n. sp.; 7. *Laspeyresia confusana* n. sp.

nated a specimen from the latter locality in the Collection of the American Museum of Natural History as the holotype. In the Canadian National Collection are three paratypes from Ottawa and through the courtesy of the American Museum authorities I have been enabled to compare them with the lectotype and find that they undoubtedly represent the same species.

A slide of the male genitalia, made from a specimen which certainly agrees with our paratypes, does not altogether agree with Heinrich's figure (fig. 359), based on a male from Blue Hill, Me.; I give therefore a fresh drawing (fig 4) of these parts and would call attention to the close relationship with *walkerana* Kft. and *transmissana* Wlk., notably in the short, broad, chunky nature of the apical section of the tegumen.

Momonana is distinguished by the rather even brown suffusion along the entire costal half of wing, the oblique and slightly convex inner margin of the dorsal white patch, the presence of 3 or 4 distinct black transverse bars in the ocellar patch and *a small brown patch* at lower inner corner of same, just above the anal angle of wing.

Mixed in with our *momonana* I have found a few specimens of an apparently undescribed species which differs quite considerably in genitalia as a reference to the figures will show. I described this as follows:

Epinotia removana n. sp.

Palpi and head light ochreous, slightly smoky on vertex. Thorax and primaries deep smoky brown, the latter sprinkled with light brown subapically and along outer margin. Costal fold in male to middle of costa. A white, median subrectangular, dorsal patch, extending upward to cell, the inner edge almost perpendicular to inner margin, faintly bisected by a dark line which on inner margin is preceded and followed by a dark dot. Dark tornal patch more or less connected with a dark patch at end of costal fold to form an inconspicuous oblique dark band. Ocellar patch defined by two vertical, silvery white bars, containing a narrow patch of the ground color with some light brown scaling but only a faint trace of black transverse lines; at upper end of ocellar patch a small but rather distinctive patch of deep brown. The usual four germinate white dashes along outer half of costa, prolonged by oblique silvery lines, the inner pair of dashes joined to the inner vertical ocellar bar, the next two connecting first with each other and then with the outer vertical bar of ocellar patch. Fringe smoky with dark basal line and cut by a white dash below apex of wing. Secondaries deep smoky with paler fringes. Expanse 12 mm.

Holotype— ♂, Waterton Lakes, Alta., June 20, 1923, (J. McDunnough); No. 3893 in the Canadian National Collection, Ottawa.

Paratypes—2 ♂, same data; 2 ♂, Aweme, Man., June 10, 13, (N. Criddle); 1 ♂, Mt. Albert, Gaspe Co., Que., July 20, (W. J. Brown); one of the Waterton specimens deposited in the Collection of the American Museum of Natural History.

Apart from genitalia the species is separable among other things from *momonana* by its slightly smaller size, darker brown color of primaries, the presence of an oblique postmedian band, lack of distinct black bars in ocellus, and of the black spot above tornus on the lower inner side of ocellar patch.

LASPEYRESIINAE.

Dichrorampha vancouverana n. sp.

Male. Palpi pale ochreous, tipped with smoky. Head and thorax deep smoky gray. Primaries, with costal fold, deep smoky gray, heavily and evenly suffused, except in the basal area, with orange-brown scaling. On outer half of costa the usual dark streaks, about 10 in number, separated by pale ochreous scaling and produced inwardly by oblique, anastomosing streaks of orange color but without any purplish-metallic suffusion. The usual three black dots at centre of outer margin. Fringes deep smoky, somewhat metallic, cut by a paler line near base. Secondaries deep smoky; fringes dull creamy with a dark smoky basal line. Beneath deep smoky with the outer half of costa pale ochreous, with dark streaks as above. Expanse 14 mm.

Holotype— ♂, Comox, Vancouver Is., B. C., July 9, (J. McDunnough); No. 3886 in the Canadian National Collection, Ottawa.

I can find nothing among the western members of this genus in Heinrich's revision which at all corresponds with this species, either in the coloration of the forewing or in the male genitalia (fig. 5), which seem quite unique.

Laspeyresia costastrigulana n. sp.

Female. Palpi and front of head pale creamy; head behind antennae deep smoky; thorax deep smoky with pale ochreous patagia. Primaries deep black brown; a pair of prominent, broad, outwardly oblique, cream-colored streaks on costa before middle, separated by a fine line of ground color and terminating in the cell with a slight purplish-metallic suffusion; beyond these streaks is a broad area of ground color followed by five equally spaced, short, oblique, pale dashes; below the first pair is a small purple-metallic patch and the third dash is extended by a similarly-colored line to outer margin below apex. Above middle of inner margin are two obscure purple-metallic streaks and the ocellar area is defined by two upright parallel bars of the same purple color and contains four obscure transverse dashes, scarcely darker than the ground-color of wing. Fringes metallic lead-color, tipped with white at apex of wing and with a dark brown basal line. Secondaries deep smoky, paling slightly basally. Fringes with outer half pale. Expanse 10 mm.

Holotype— ♀, Bobcaygeon, Ont., June 20, (J. McDunnough); No. 3887 in the Canadian National Collection, Ottawa.

Paratype— ♀, same data, June 29.

Apart from the small size and rather characteristic maculation of forewing the species is unique in having veins 6 and 7 of the hindwings distinctly stalked, a feature which is not recorded by Heinrich as occurring in this subfamily; whether it has generic value I am unable to say, and it seems well to await the receipt of a male before deciding this point. The genitalia (fig. 6) seem to be closest to those of *prosperana* Kft. as figured by Heinrich (fig. 144).

Laspeyresia confusana n. sp.

Head, palpi and patagia pale creamy-ochreous; remainder of thoracic vestiture (rather rubbed) appears to be deep purple-brown. Primaries deep purple-brown with a slight admixture of pale ochreous scaling and some brighter brown suffusion in ocellar and terminal areas. A prominent subrectangular pale ochre-

ous patch at middle of wing, defined sharply outwardly by a dark tornal patch, but continued inwardly along inner margin by a pale shade which loses itself gradually in the purple-gray color of the extreme base of wing; this pale patch extends costad as far as cell and contains a few dark scales below upper margin. A small dark patch on costa at one-fourth and another similar one at one-half, the area between occupied by two pale streaks faintly separated by a dark line. Beyond the second dark patch the apical half of costa contains four germinate pale dashes, each pair separated from the following one by a small dark spot; the first two pairs and again the outer pairs are united inwardly by purple-metallic streaks which in turn unite with the inner and outer bars of the ocellar area respectively; above the pale dorsal patch there is also some diffuse purple-metallic shading. The ocellar patch comprises two purple-metallic upright bars, containing some lighter brown scaling crossed by three to four blackish streaks. A pale ochreous terminal line; fringes lead-colored with a blackish basal line, cut by pale ochreous streaks below apex and twice at anal angle. Secondaries deep smoky; fringes pale with dark basal line. Expanse 13 mm.

Holotype— ♀, Mt. Douglas, Victoria, B. C., June 16, (J. McDunnough); No. 3888 in the Canadian National Collection, Ottawa.

The specimen is very similar to a paratype of *obnisa* Heinr. (Mt. Newton, B. C.) in our collection which is unfortunately without abdomen, but the genitalia do not fit in at all well with Heinrich's figure (fig. 164) and appear to be closer to those of *rana* Forbes, from which, however, it is entirely different in maculation. In *obnisa*, as far as I can tell, the dorsal patch is not extended basad, there is scarcely any dark costal spot at one-fourth and the terminal line is much darker and less prominent; the scaling of the head is also considerably darker.

Peronea variegana Schiff.

I have recently received two male specimens of this European species from Mr. W. Downes, collected at Victoria, B. C., Sept. 14, 1929, and Aug. 30, 1933, respectively; this species was not included in my revision and has not heretofore been recorded from the North American continent. The two specimens belong to the typical form with white basal half and red-brown outer area of primaries and agree well with Kennel's figure (Pl. V, fig. 11). The genitalia are rather similar to those of *hastiana* L., but the cristae are much reduced and the armature of the aedeagus consists of a stout spine (rose-thorn) and a bundle of about eight moderate-sized cornuti. Pierce's figure (Gen. Brit. Tort. Pl. IX) is quite accurate. The species would fall in my arrangement just before *robinsoniana* Forbes.

Peronea kearfottana McD.

A long series of this species was bred by me in 1934 from larvae found on Sweet Fern (*Comptonia*) in June at Annapolis Royal, N. S.,; the moths emerged in early July.

Peronea semiannula Rob.

In my Revision I gave the food-plant of this species rather doubtfully as maple. Since then, however, I have received a few specimens from Mr. L. Daviault, bred at Berthierville, Que., from *birch*, which fall according to genitalic characters under this specific name, as I understand it. This is the first authentic food-plant record I know of for the species.

Peronea hudsonia Wlk.

A specimen has been received from Mr. F. C. Gilliatt, bred from a larva found on willow at Lawrencetown, N. S. This is not only a record for the province but also the first definite food-plant record of which I am aware.

THE EFFECT OF PHOTOPERIODISM ON RESTING, TREEHOLE, MOSQUITO LARVAE

(Preliminary Report)

BY F. C. BAKER,
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During the past few years several workers in culicid biology have made studies of the rest period that accompanies the hibernation of certain temperate and subtropical treehole mosquitoes. Incidental to these studies several attempts have been made to bring on prematurely the phase of active development by artificial agents. Roubaud (2, p. 1126) has shown that young, first stage, *Aedes geniculatus* larvae can be induced to hatch from the egg and to begin active development by means of certain enzymatic ferments. As far as the writer knows, no one has yet reported any successful attempts to activate resting larvae in the more advanced stages.

Tate (5, p. 111) found that *Orthopodomyia pulchripalpis* larvae, which were brought indoors during the fall, showed no further development throughout the winter. Roubaud and Colas-Belcour (4, p. 968) observed that *Anopheles plumbeus* larvae would pass the winter in a heated laboratory. Legendre (1, p. 1264) reports a similar behavior for the larvae of *A. geniculatus*. In the early autumn of 1933 the writer collected large numbers of second stage *Anopheles barberi* Coq., larvae; also, *Orthopodomyia signifera* Coq. larvae of various sizes. They were placed with copious quantities of water from their natural habitats in artificial treeholes at the insectary greenhouse. These containers were made by sawing a hollow maple log into sections and plugging one end with a slab of balsa wood. During the fall and winter of 1933-34 an effort was made to keep the temperature of the greenhouse within a range that would be most conducive to plant and insect development. These resting larvae showed no growth until spring. They emerged but slightly ahead of those which were left out-of-doors in their normal environment. Simultaneously, attempts were made to arouse other resting *A. barberi* larvae by exposing them to ethylene chlorohydrin gas. No stimulation was detected. Still another group of second stage *A. barberi* larvae were frozen and thawed repeatedly in natural treehole water. After the freezing treatments the container was placed permanently in a warm room, but the larvae so treated showed no advancement over the checks. This last experiment corroborates the findings of Roubaud and Colas-Belcour (4, p. 966) for *A. plumbeus*.

In making observations on the life cycles of various members among the obligate treehole fauna in the vicinity of Ithaca, New York, the writer was impressed by observing that many of the members assumed the resting phase before frost in the fall and became active while freezing weather still prevailed in the spring. The length of day at the time of year when growth activities are suspended almost exactly coincides with the length of day at the time of year when development is resumed. This deduction led the writer to wonder if the length

*Contribution from the Department of Entomology.

of day might not be the limiting factor when temperatures were favorable to larval development. The following experiments were set up to test out this possibility.

PRELIMINARY TEST.

On the fifth of December, 1934, a rather crude experiment was started to determine if this theory could be substantiated. An artificial treehole was placed upon the greenhouse bench. The water contained a good representation of the common overwintering treehole fauna. The day was prolonged on the evening end by six hours of electric lighting. Similar artificial treeholes, under the bench, were used as checks. By the middle of December the culicid larvae in the treehole on the bench showed some increase in growth and a marked change in behavior. No observations were made during the holiday period.

On January fifth a careful survey of the contents in the long day treehole showed only the empty pupal cases of the mosquitoes that had emerged. Pupae of *Culicoides guttipennis* Coq. (Nematocera Ceratopogoninae) were giving rise to imagos. The *Helodes* sp.* (Coleoptera Helodidae) larvae had disappeared. Slight signs of activation were manifest in the checks. The experiment was discontinued on January 9th, 1935.

From this rough trial it was concluded that something unusual had happened. It was now decided to plan definite experiments to test this theory.

EFFECT ON UNHATCHED LARVAE.

During the summer of 1934 the females in a cage-colony of *Aedes triseriatus* Say chose a white pine stick which was standing in a crock of stagnant water as a favorite place for oviposition. They quickly blackened the stick with a deposit of eggs for about an inch in distance from the water surface. By the end of September every one of the several eggs which were examined had a fully developed embryo in it. During October and November a few attempts were made to induce hatching by soaking the stick for 24 hours in treehole water. Not an egg hatched.

When the first photoperiod experiment was begun the pine stick was split in such a way as to divide almost equally the egg mass into two parts. One-half was laid upon the bench at a distance of about two feet from two 100-watt blue Mazda bulbs with ventilated reflectors that were over the long day treehole. The other half was placed immediately under the bench where it received indirect daylight and hardly any artificial light. The dry halves with their egg deposits were left in these two illumination environments for five weeks. The air moisture ranged from 60 to 90 per cent relative humidity.

Following this treatment each half was submerged in a dish of filtered treehole water. At the end of 18 hours two larvae had hatched from the egg mass on the short day (about 10 hours) half. No more hatched. The water containing the half of the stick which received supplemented daylight swarmed with first stage larvae. These matured in about four weeks and the adults are on the date that this is written (March 10th), active in the large rearing cage. The females take blood readily but, as yet, have not deposited any eggs.

*Since this manuscript was written the beetle has been determined as *Helodes fuscipennis* Guer. This determination has been confirmed by Dr. Barber of the U. S. National Museum.

EFFECT ON HATCHED LARVAE.

A general thaw during the early part of January, 1935, melted the ice and snow in the treeholes. *A. barberi* and *C. guttipennis* larvae were collected. Two bamboo-joint containers, which frequently were used for rearing *Aedes aegypti* Linn. larvae, were thoroughly scrubbed out. Each had a capacity of about 250 cubic centimeters and a water surface area of about 15 square centimeters. They were filled with treehole water that had been filtered through a paper towel.

TABLE I.—WEEKLY RECORD OF CULICINE DEVELOPMENT.

Long Day Treehole	Short Day Treehole
Initial Contents (Jan. 12th)	
5 second stage *A. barberi* larvae	5 second stage *A. barberi* larvae
2 third stage *A. barberi* larvae	2 third stage *A. barberi* larvae
1 second stage *O. signifera* larva	1 third stage *O. signifera* larva
Many *C. guttipennis* larvae	Many *C. guttipennis* larvae
Weekly Inspection of Jan. 19th.	
1 second stage *A. barberi* larva	4 second stage *A. barberi* larvae
6 third stage *A. barberi* larvae	2 third stage *A. barberi* larvae
1 third stage *O. signifera* larva	1 third stage *O. signifera* larva
A few *C. guttipennis* larvae	Many *C. guttipennis* larvae
Weekly Inspection of Jan. 26th.	
1 third stage *A. barberi* larva	4 second stage *A. barberi* larvae
5 fourth stage *A. barberi* larvae	2 third stage *A. barberi* larvae
1 fourth stage *O. signifera* larva	1 third stage *O. signifera* larva
1 large *C. guttipennis* larva	Several *C. guttipennis* larvae
Weekly Inspection of Feb. 2nd.	
1 fourth stage *A. barberi* larva	3 second stage *A. barberi* larvae
4 *A. barberi* pupae	2 third stage *A. barberi* larvae
1 emerging female *A. barberi*	1 third stage *O. signifera* larva
1 *O. signifera* pupa	Several *C. guttipennis* larvae
Weekly Inspection of Feb. 9th.	
1 *A. barberi* pupa	3 second stage *A. barberi* larvae
	1 third stage *A. barberi* larva
	1 third stage *O. signifera* larva
	Several *C. guttipennis* larvae

Into each container were placed seven freshly collected *A. barberi* larvae; many *C. guttipennis* larvae of varied sizes, and one *O. signifera* larva that had been collected during the previous October and stored at 5°C. in a refrigerator. The bamboo-joints were set a few feet apart on a bench in the greenhouse. The same artificial lighting arrangement was placed 18 inches above the water surface of the receptacle that was chosen to similate a long June day. Each afternoon the lights were turned on at 4 o'clock. At 11.15 p. m. they were turned off by a timing clock. The daylight, supplemented by the electric lights, gave the contents of this bamboo-joint a photoperiod of nearly 16 hours each day. Under the short day container several layers of black cloth were placed. Every evening between 4 and 5 o'clock a crock with a dark colored, interior glazing was inverted over this receptacle on the black cloth. In the morning between 7 and 8 o'clock it was removed. This gave the short day container about the same amount of daylight as normally occurs during December in this latitude.

This experiment was begun on the twelfth of January, 1935, and was terminated just four weeks after its beginning. At the end of each week the contents of the containers were poured into white-bottomed pans and the developmental stages of the larvae recorded. The results are shown in Table Number 1. Conditions at the surface of the water were observed twice daily.

During the first week of the experiment a bacterial film tended to form over the surface of the water in both bamboo-joints. Thereafter it gave trouble only in the short day container. This trouble was reduced by adding equal amounts of fresh, filtered, treehole water to each receptacle whenever either one showed signs of a detrimental scum. Enough water was added so as to overflow slightly the contents of these dishes and thus flush off the film. In spite of this precaution, some mortality occurred in the check.

Toward the end of the first week a few *C. guttipennis* pupae were seen in the container with the long light-period. At the same time it was observed that the anopheline larvae were becoming positively phototropic and were cruising about over the surface of the water by means of the movements of their mouth brushes. The *C. guttipennis* larvae that were not mature enough to pupate before the *A. barberi* larvae became active and commenced to feed, soon disappeared, for the latter are predacious upon the former. Between February first and tenth seven empty anopheline pupal cases were removed from the bamboo with the long photoperiod. The larva of *O. signifera* pupated and was removed.

The larvae in the short day container showed no signs of growth. All of the culicids remained photophobic and revealed no evidence of feeding throughout the duration of the experiment and for several weeks thereafter.

Food in the form of leaf meal (equal numbers of dry ash, elm, maple, and oak leaves powdered, and sifted through mosquito netting) was added weekly at the rate of one milligram per milliliter. Every week a disc of fresh, green, lettuce leaf with a diameter of one centimeter was added to each habitat.

The only observed difference between the test and the check containers was a slight rise in the surface temperature of the water in the long day container. It appeared during the period of artificial illumination and never exceeded the temperature of the check by more than 1.5°C. This slight difference does not seem significant to one who is familiar with the wide ranges of temperature that are found, simultaneously, among the natural treeholes in which these larvae develop.

DISCUSSION.

It is now generally accepted that the gradually shortening days of late summer bring on the fall brood of winged migrants among the two-host species of aphids which are found in the temperate zones (6, p. 114). It would not be surprising to find other insects of the cooler zones being guided through their biological phases by the variations in light duration. Length of day is a more stable factor in their environment than temperature. If the photoperiod were not a limiting factor during the season of low temperatures, the absence of sufficient heat would limit development.

Wild *A. triseriatus* suspends activities about the middle of September (usually before frosts occur in this locality). The same is true for cage-colonies in a heated greenhouse. The wild ones hatch from the eggs during the first week in

April (when there is still freezing weather). It will be observed that these two dates are about equidistant from the shortest day of the year. The hours of possible sunshine in this latitude at those periods are about 12.6 hours per day. So, it would seem that *A. triseriatus* could breed in any season of any region where the length of day exceeded the minimum hours of required light—providing that other environmental factors were not limiting.

For species that are indigenous to tropical climates where the length of day changes but little, where the seasons are wet and dry rather than warm and cold, one would expect a different set of factors to govern their biological phases.

Roubaud (3, p. 765) observed that the larvae of *A. plumbeus* normally show negative phototropic reactions. The writer found the same to be true for resting *A. barberi* and *O. signifera* larvae. However, with the first signs of a transition to the active developmental phase, these larvae seemed to become indifferent to illumination.

On the seventeenth of February one adult of the common treehole species of *Helodes* was caught on the screen of the insectary cage where the first artificial lighting experiment had been carried out. The normal period for this beetle to emerge (under insectary conditions) is the first week in June. Five or six weeks are required for the pupal stage. This points strongly to the possibility that at least one of the *Helodes* sp. larvae was affected by the longer light period and successfully pupated.

So far, all attempts to return activated larvae to the resting condition by again putting them under short day lighting have been unsuccessful.

From the results of the above experiments and from other observations and experiments (not reported here), it may be concluded that for species discussed in this paper the length of day (i. e. photoperiod) is the dominant factor in initiating the rest period in the autumn and bringing about larval activity in the spring.

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THE OCCURRENCE OF TWO SPECIES OF CECIDOMYIDS ON MEADOW FOXTAIL (ALOPECURUS PRATENSIS L.) HITHERTO UNREPORTED IN CANADA.

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For the purpose of determining whether foxtail midges occurred in Canada and if so their range, a survey of places where meadow foxtail grass, *Alopecurus pratensis* L. was known to be grown was made in the spring of 1934. This survey followed a request for information upon the point by Dr. L. E. Kirk, Dominion Agrostologist, on behalf of Dr. R. O. Whyte, Chief Officer of the Imperial Bureau of Plant Genetics; Herbage Plants, Aberystwyth, Great Britain. Dr. Whyte is interested in discovering areas free from foxtail midges which might be used for the production of meadow foxtail seed. The location of stands of the grass were secured through Dr. Kirk and co-operation in making observations was sought and readily obtained from various people living in the vicinity of these stands in Canada. It is for the purpose of obtaining further co-operation and assistance from those who have already helped with this survey that this paper is published. It only purports to give a progress report on the findings up to date and a few notes on the species present in Canada.

Reports have been received from the following places: Tantramar dykelands, N. B.; Avonport, N. S.; Ottawa, Ont.; Guelph, Ont.; Manitoba University, Winnipeg, Man.; Agassiz, B. C.; and Victoria, B. C. From these reports it is apparent that midges attacking meadow foxtail are present in New Brunswick and Ontario. In Manitoba and British Columbia these insects have not as yet been recorded.

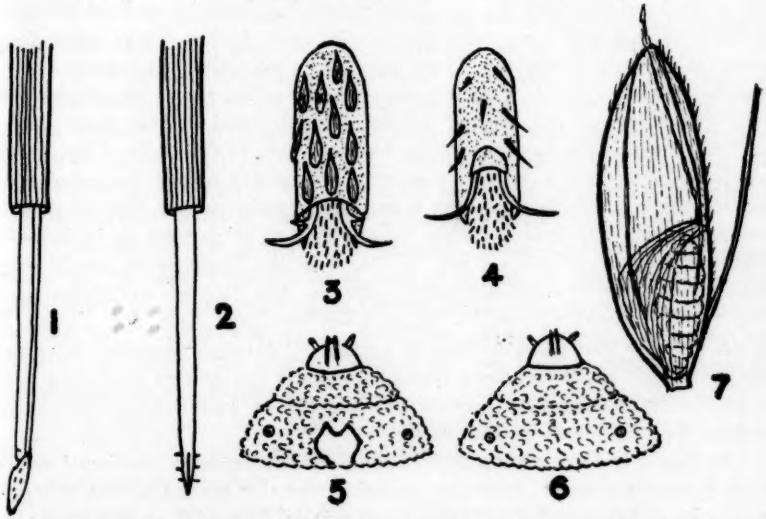
Considerable assistance has been obtained in this study from Dr. H. F. Barnes, of the Rothamsted Experimental Station who kindly determined the species sent to him as *Dasyneura alopecuri* Reut. His paper (1930, Ann. Appl. Biol.. XVII, p. 330) on the biology of gall-midges attacking foxtail has greatly simplified the study of these insects in Canada.

In Europe, according to Dr. Barnes, there are three species which occur in sufficient numbers to be of economic significance where foxtail grass is grown for the production of seed, namely, *Dasyneura alopecuri* Reut., *Stenodiplosis geniculati* Reut., and *Contarinia merceri* Barnes. *D. alopecuri* Reut. and *S. geniculati* Reut. are to be found in the larval stage within the florets when the seed is harvested and will remain there for a considerable time. In meadow land where seed is not gathered the larvae will reain in the florets which have fallen to the ground and stay there in a quiescent state over winter and until a few days before they emerge as adults. Pupation takes place some eight days before emergence. *D. alopecuri* Reut. has a single generation and *S. geniculati* Reut. two generations each year. *C. merceri* Barnes has a somewhat different life cycle. The larvae do not stay within the florets to pupate but fall to the ground where they remain quiescent until pupation in the spring. Unlike the other two species, the larvae of this species do not as a rule occur singly; up to 15 larvae have been found in a single floret. This species is responsible in Europe for the so-called "blindness" of large quantities of this grass.

Dasyneura alopecuri Reut. was taken ovipositing on foxtail at the Central Experimental Farm, Ottawa, on May 26, 1934. This species was also collected by R. P. Gorham, Fredericton, in the Tantramar dykelands, N. B., ovipositing on June 13, 1934. Two females of *Stenodiplosis geniculati* Reut. were reared in 1934 by Professor L. Caesar, Provincial Entomologist for Ontario, from foxtail heads. These individuals emerged in the last week of June.

In the adult stage these two species can be distinguished by the following characteristics:

	D. alopecuri Reut.	*S. geniculati* Reut.
Maxillary palpi	4-segmented	3-segmented
Ovipositor	Pocket-shaped (fig. 1)	Needle-shaped (fig. 2)
Tarsal claws	Toothed (fig. 3)	Simple (fig. 4)



D. alopecuri Reut.: 1—ovipositor; 3—tarsus; 5—anterior ventral segments of full grown larva; 7—larva in situ; *S. geniculati* Reut.: 2—ovipositor; 4—tarsus; 6—anterior ventral segments of full grown larva.

The larvae of *D. alopecuri* Reut. are dark orange colour with a two-pointed sternal spatula appearing on the first thoracic segment in the last instar (fig. 5). In shape they are almost oval when full grown. *S. geniculati* Reut. larvae are honey yellow in colour, more elongate in shape than *D. alopecuri* Reut. and do not possess a sternal spatula (fig. 6).

Dasyneura alopecuri Reut. Oviposition by this species was observed in New Brunswick in the middle of June. At Ottawa, it was first seen ovipositing on May 26 and oviposition continued for two more days. Three days is not necessarily the duration of this activity in the Ottawa district. It may have started before as no observations were made prior to that date. No males of this species or of *S. geniculati* Reut. were taken in the field. According to Barnes this is to be expected, as the males are not noticed in the field even if the females are plentiful. Breeding from grass samples is the only fruitful method of obtaining males, and one male and one female have been procured up to the present by

this method in Ottawa. The eggs are laid singly on the inside of the inner glumes. The developing larva works it way down to the ovary and by the time it has matured it can usually be found in a characteristic position with its head next to the base of the seed and with the sternal spatula against the seed (fig. 7). The larvae overwinter within the florets wherever they may fall. This species appears to be the more abundant in the Ottawa district. In certain heads of foxtail as many as 80 per cent of the florets have contained larvae.

Stenodiplosis geniculati Reut. This species has two generations per year. Adults from the overwintering generation have not been observed. Females of the first generation were reared at Guelph, Ont., from foxtail heads. They emerged about June 22. Pupae were obtained in heads of foxtail at Ottawa as early as June 11 and the empty pupal cases from which the adults had emerged could be distinguished with the naked eye, protruding from the ends of the florets. The head, thorax, and wing cases are dark in color, almost black, whilst the remainder of the body is hyaline. These pupal cases were first observed on June 20. Emerging adults, however, were not observed. It seems rather improbable that a second generation of this species would establish itself in the same stand of foxtail from which the first generation had emerged, as the seeds of the grass at the time of emergence were well formed. This would provide an adverse condition for the establishment of first instar larvae which would have to penetrate a well developed seed coat for their food. This point appears to be borne out at Ottawa, for no *geniculati* could be found in the heads from which several thousand florets were examined after June 20, the date of emergence of the adults. As *S. geniculati* Reut. in Europe (Keiffer, 1900, Ann. Soc. Entom. Fr., 338) has another host plant in floating foxtail, *Alopecurus geniculati* L., a grass which is found in moist meadows, banks of streams and ditches from Newfoundland to British Columbia, it may be possible that a second and overwintering generation may be found in this grass.

In regard to *Contarinia merceri* Barnes, which has been mentioned as common on foxtail in Europe, it is very probable that this species is also present in Canada. In an examination of many thousands of florets of foxtail gathered at Ottawa, many blind florets were found. In heads gathered early in June florets were found containing clusters of eggs. These clusters comprised anywhere from 2 to 12 eggs. From heads gathered a day or so later, florets were found containing several larvae per floret. These larvae were so small that definite identification was impossible. It was unfortunate that these larvae could not be reared, but the grass heads have been preserved in 70 per cent alcohol for later examination. No more of these larvae could be found in grass gathered after June 11. However, due to the fact that more than one larva per floret was found, it seems very probable that these larvae are *C. merceri* Barnes; *D. alopecuri* Reut. and *S. geniculati* Reut., as a rule, only appear singly in the florets.

RECORDS OF MALLOPHAGA AND OTHER EXTERNAL PARASITES FROM BIRDS AT CHURCHILL, MANITOBA.

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Late in 1934, Arthur Gibson, the Dominion Entomologist, received from Miss A. M. Heydweiller, of the Laboratory of Ornithology, Cornell University, a number of collections of external parasites taken from twenty species of birds at Churchhill, Man., during the summer of that year. These were passed to me by Mr. Gibson, and were found to consist of 27 collections of biting lice (Mallophaga), two of fleas (Siphonaptera) and two of mites (Acarina).

Canadian records of such parasites are comparatively few. Thompson (3) recently published a number of records of biting and sucking lice from Canadian hosts, and listed nine references to papers containing previous ones. To these must be added a paper by Peters (2) and one by Whitehead (4). The species of Mallophaga included in the present paper are recorded for the first time in Manitoba, and with six exceptions, for the first time in Canada. The exceptions are *Anatoecus dentatus* (Scopoli), *Philopterus subflavescens* Geoffroy, *Degeeriella actophila* (K. & C.), *D. complexiva* (K. & C.), *D. opaca* (K. & C.) and *Lipeurus protervus* Kellogg, which have been previously recorded on birds in the extreme north of Canada by Baker (1) and Peters (2).

My thanks are due to Dr. H. E. Ewing, Bureau of Entomology, Washington, D. C., who identified the mites, and to Dr. M. A. Stewart, of the Rice Institute, Houston, Texas, who identified the fleas. My determinations of the Mallophaga were checked over by H. S. Peters, of the Bureau of Entomology, Washington, to whom I am greatly indebted for this kind co-operation, and for helpful suggestions and advice.

MALLOPHAGA

Suborder *Amblycera*

Family *Menopomidae*

Menopon sp. Host: lesser yellowlegs, *Totanus flavipes*, 15.VII.

Actornithophilus spinulosum Piaget. Host: semipalmated sandpiper, *Ereunetes pusillus*, 9.VII.

Actornithophilus spp. (specimens immature from the first three species of birds). Hosts: least sandpiper, *Pisobia minutilla*, 14.VII; red-backed sandpiper, *Pelidna alpina*, 12.VI; stilt sandpiper, *Micropalama himantopus*, 12.VI; semipalmated plover, *Charadrius semipalmatus*, 17.VII; arctic tern, *Sterna paradisaea*, 9.VII.

Family *Ricinidae*

Ricinus diffusus (Kellogg). Host: savannah sparrow, *Passerculus sandwichensis*, 20.VI.

Suborder *Ischnocera*

Family *Philopteridae*

Anatoecus dentatus (Scopoli). Host: old squaw duck, *Clangula hyemalis*, 14.VII.

Philopterus subflavescens Geoffroy. Hosts: tree sparrow, *Spizella monticola*, 4.VI; Gambel's sparrow, *Zonotrichia leucophrys*, 7.VI; snow bunt-

ing, *Plectophenax nivalis*, 7-8.VI; common redpoll, *Acanthis* sp. 8.VI. & 11.VII; Smith's longspur, *Calcarius pictus*, 13.VI; stilt sandpiper, *Micropalama himantopus*, 18.VII; northern phalarope*, *Lobipes lobatus*, 27.VI.

Degeeriella actophila (Kell. & Chap.). Host: arctic tern, *Sterna paradisaea**, 9.VII.

D. complexiva (Kell. & Chap.). Hosts: semipalmated sandpiper, *Ereunetes pusillus*, 7.VI; arctic tern, *Sterna paradisaea**, 9.VII.

D. connexa (Kell. & Mann)†. Host: northern phalarope, *Lobipes lobatus*, 27.VI & 9.VII.

D. falcigera Peters. Host: lesser yellowlegs, *Totanus flavipes*, 15.VII and 24.VII.

D. opaca (Kell. & Chap.). Host: semipalmated plover, *Charadrius semipalmatus*, 17.VI.

D. oraria (Kellogg). Host: golden plover, *Pluvialis dominicus*, 16.VII.

Degeeriella sp. Host: hudsonian curlew, *Numenius hudsonicus*, 28.VI.

Lipeurus protervus Kellogg. Host: willow ptarmigan, *Lagopus lagopus*, 13 and 18.VII.

SIPHONAPTERA.

Family *Dolichopsyllidae*

Ceratophyllus garei Rothschild. Hosts: lapland longspur, *Calcarius lapponicus* 4.VI; Smith's longspur, *C. pictus*, 27.VI.

ACARINA.

Family *Analgesidae*

Analges longispinosus Tyrell. Host: snow bunting, *Plectrophenax nivalis*, 8.VI.

Family *Parasitidae*

Laelaps microti (Ewing). Host: horned lark, *Otocoris alpestris*, 9.VI.

Ewing states that *Laelops microti* (Ewing) was present on the bird host as a straggler from some small animal. The mammal in question may have been the Drummond vole as specimens of *L. microti* taken from one of these animals, at Churchill, 27.VI.1934, were received from Miss Heydweiller.

LIST OF HOSTS WITH PARASITES.

HOST	PARASITE
Sterna paradisaea	*Actornithophilus* sp.
	Degeeriella actophilla (Kell. & Chap.)*
	D. complexiva (Kell. & Chap.)*
Clangula hyemalis	*Anatoecus dentatus* (Scopoli)
Lobipes lobatus	*Philopterus subflavescens* Geoffroy*
	Degeeriella connexa (Kell. & Mann).
Micropalama himantopus	*Actornithophilus* sp.
	Philopterus subflavescens Geoffroy
Pisobia minutilla	*Actornithophilus* sp.
Ereunetes pusillus	*Actornithophilus spinulosum* Piaget

*Occurring as stragglers on these birds according to H. S. Peters.
†Determined by H. S. Peters.

	Degeeriella complexiva (Kell. & Chap.)
Pelidna alpina	*Actornithophilus* sp.
Totanus flavipes	*Menopon* sp.
	Degeeriella falcigera Peters
Numenius hudsonicus	*Degeeriella* sp.
Pluvialis dominicus	*Degeeriella oraria* (Kellogg)
Charadrius semipalmatus	*Actornithophilus* sp.
	Degeeriella opaca (Kell. & Chap.)
Lagopus lagopus	*Lipeurus protervus* Kellogg
Otocoris alpestris	*Laelaps microti* (Ewing)*
Acanthis sp.	*Philopterus subflavescens* Geoffroy
Plectrophenax nivalis	*Philopterus subflavescens* Geoffroy
	Analges longispinosus Tyrrell
Calcarius lapponicus	*Ceratophyllus garei* Rothschild
Calcarius pictus	*Philopterus subflavescens* Geoffroy
	Ceratophyllus garei Rothschild
Passerculus sandwichensis	*Ricinus diffusus* (Kellogg)
Zonotrichia leucophrys	*Philopterus subflavescens* Geoffroy
Spizella monticola	*Philopterus subflavescens* Geoffroy

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THREE RARE CANADIAN HEMIPTERA*

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Specimens of three species of Hemiptera have recently come to the attention of the writer. Since two of these represent new family records for the Canadian fauna and the third is a genus hitherto unreported from North America it seems advisable to place their occurrence on record. The specimens are deposited in the Canadian National Collection. The records are as follows:

FAMILY ENICOCEPHALIDAE

Systelloderes biceps (Say)—Ironsides (near Hull) Quebec, June 15, 1932 (W. J. Brown); Cascapedia, Quebec, Aug. 21, 1933 (W. J. Brown)—8 specimens found crawling on stones. In literature this species is reported as ranging from New England west to Utah and southward to Florida, Cuba and Mexico. The most northern record hitherto noted appears to be that of Johannsen who reported the species occurring in numbers at Ithaca, N. Y.

FAMILY CRYPTOSTEMMATIDAE

Ceratocombus vagans McA. and Mall.—Biscotasing, Ont., July 25, 1931

(K. Schedl). This species has been recorded from New York and Maryland southwest to Florida and Panama.

FAMILY BERYTIDAE (NEIDIDAE)

Berytus minor (H. S.)—Prince Edward Co., Ont., April 7, 1929, (J. F. Brimley). This appears to be the first record of a species of *Berytus* from North America. Through the kindness of Dr. T. Jaczewski I have been provided with specimens of *B. minor* from northern Europe. I can observe no difference between them and the specimen received from Mr. Brimley. In McAtee's arrangement of the Nearctic genera (Jl. N. Y. Ent. Soc. XXVII, 79, 1919) *Berytus* falls in his section BB. differing from *Protacanthus* and *Neides* in having the thorax without erect spines and the head bearing an epistomal crest.

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*Contribution from the Division of Systematic Entomology, Entomological Branch, Department of Agriculture, Ottawa.

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